Appendix E

NURP - Urban Design and Environmental Performance Modelling - Stage 3 (UDEPM)

Report Summary

UDEPM Purpose

The objectives of the UDEPM were to provide an evidence base to:

1. Determine which of the 4 sets of built form controls being tested would yield an acceptable balance between key development feasibility metrics and environmental performance;

2. Inform the development of built form guidelines and requirements that can be integrated into the Precinct Structure Plan (PSP) for NURP and relevant built form codes;

3. Determine if the UDEPM of NURP can be used as an ongoing evidence based decision support tool to guide the long term sustainable development NURP or other precincts.

Summary of findings

1. Optimum built form controls

Four built form scenarios were tested, evaluated and compared, refer to Table 1 – *Modelled Scenarios Matrix* for scenario details (next page).

Built form and environmental indicators were identified to assess and compare the performance of the modelled scenarios.

Built Form Indicators
- Gross Floor Area (GFA)
- Net Saleable Area (NSA)
- Building Efficiency (BE)
- Floor Area Ratio (FAR)
- Wall to Floor Area Ratio (WFAR)

Environmental Indicators
- Urban Daylight (SDA)
- Overshadowing and Radiation Maps

Scenario 4 yielded the best overall results. It followed the same trend as the other scenarios for all built form indicators, and performed significantly better in all environmental indicators, especially for Spatial Daylight Autonomy (SDA).

A key project finding is to use the Scenario 4 built form controls and parameters for the NURP Design Code as shown in Table 1.

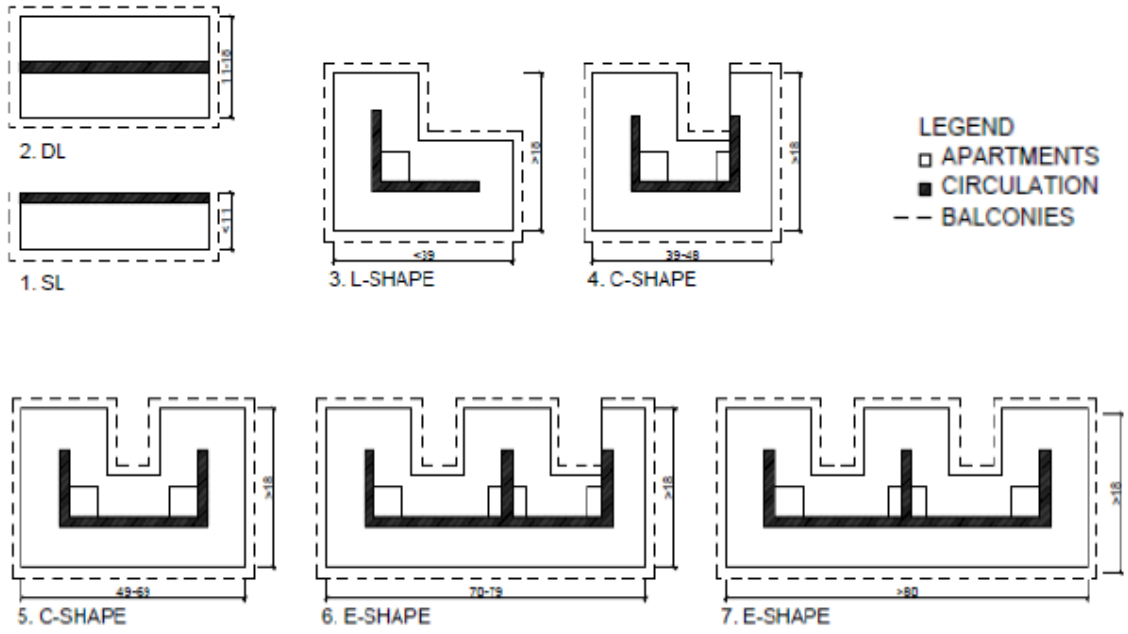
Table 1 - Modelled Scenarios Matrix

Project parameter	Podium	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Roads Types	number of stories / setback at street edge (meters) & tenancy allocation	new typologies applied based on high scenario (Road width / setback above podium) in meters	S1 + new road widths (Road width / setback above podium) in meters	S2 + new setbacks	S3 + new building heights (see study area map with heights)
Main	4 / 0 4 storey podium (18m) to main road only - 4 levels non residential	34 / 5	36 / 5	36 / 10	36 / 10
Medium	2 / 0 2 storey podium (9m) to all other roads – equivalent to 3 levels of resi only (i.e. no non res)	18 / 5	22 / 5	22 / 6	22 / 6
Small	2 /3 9m podium – 3 levels of resi only (i.e. no non res)	11 / 3	20 / 3	20 / 6	20 / 6
Lane	2/ 0 9m podium – 3 levels of resi only (i.e. no non res)	4 / 3	10 / 3	10 / 6	10 / 6
Side & rear setbacks	Note this occurs across sites 4, 5, 6, 8,10,12, 24 & 26	- up to 13.5m height a 4.5m separation to a rear or side boundary (i.e. overall 9m separation between buildings on adjacent lots.) - From 13.5m upwards a 6m separation to a rear or side boundary. (i.e. overall 12m separation between buildings on adjacent lots.)			- 5m from boundary line to podium on each side (i.e. overall 10m separation between buildings on adjacent lots.) - further 6m setback above podium (i.e. overall 22m separation between buildings on adjacent lots.)
Tower separation		Tower separation 10m Applied consistently regardless of height			

2. Informing the development of built form design guidelines

Building Typologies

Seven building typologies were developed



Of the seven typologies, five were unique:

1. SL – Single loaded corridor 2. DL – Double loaded corridor 3. L – shape

4. C – shape 5. E – shape

The results established that the best performing building typologies in relation to daylight were the C and E shape building typologies.

The C building typology provides the best daylight results when combined with increased road widths, increased setbacks and varied building heights. The E building typology also yielded good daylight results when the large courtyards faced the street (ie less built form obstructions). Therefore, minimum and maximum block sizes or building footprint controls should be used to facilitate effective and sustainable building in general, and to promote certain typologies in particular, that achieve daylight performance when combined with effective building separation guidelines at ground, podium and upper levels.

Noting that variations in typology performance were linked directly to the level of built form obstruction present (ie on neighbouring sites), a design guideline strategy that ensures outlook to streets and more generous setbacks as used in Scenario 4 (as a minimum) is worth including within the PSP and design code to promote better daylight amenity outcomes while balancing built form indicators. This approach is noted as being significantly stronger than what is proposed in the Better Apartments – Draft Design Standards.

Due to the scales of buildings, orientation does not have a significant impact on daylight performance. It is building separation (road widths and setbacks) and building heights that provide the most significant improvements to daylight performance.

The results established that minimum and maximum lot sizes can be fine-tuned to become a mechanism to drive efficient building typology allocation on blocks. Based on the built form parameters used in the modelled scenarios the results showed that block dimensions of:

- Less than 50m (in either direction) yielded inefficiencies in building typology options;
- Between 90-100m x 50m yielded efficient and good daylight performing building typologies when fronting main roads.

Council should continue to explore the use of maximum and minimum lot sizes as a potential strategy to drive built form outcomes that balance both built form and environmental indicators.

Light Court Design Guidelines

The light court design guidelines proposed in the Better Apartments– Draft Design Standards were analysed and it was found that they would not provide good daylight amenity to future residents.

The proposed standard uses the Height to Separation Ratio (HSR) or Section Aspect Ratio (SAR). To provide adequate daylight under this methodology, a ratio of 3:1 or less should be achieved. Assessment of the proposed standard shows that all of the ratios exceed the 3:1 ration in the recommendation.

It is recommended that Council either:

- Develops evidence-based light court design guidelines that can be applied within NURP that ensure good daylight amenity;
- Ensures that the building typologies, setbacks and road widths as modelled are applied within NURP and light wells are to be avoided, or;
- Requires evidence (in addition to the above point) from proponents that habitable room windows facing a light well achieve the daylight benchmarks set in the Sustainable Design in the Planning Process framework under the Indoor Environmental Amenity theme.

With the UDEPM, Council has proved that adequate outcomes at a precinct level can be achieved with a certain set of building typologies, setbacks, heights and road widths. Applying those will create the certainty that a good outcome is achieved over the entire NURP. Deviations from this, eg by proposing smaller light wells, should prove that the same outcome can be achieved and has no negative flow-on effects on neighbouring potential built form.

Floor Area Ratio (FAR) limit

FAR is the Gross Floor Area (GFA) of all buildings within the site divided by the site area. This strategy is being applied in urban city contexts such as Melbourne, New York and Singapore. However Council can explore whether an FAR limit would be a useful policy mechanism that could be applied within NURP.

Floor Area Uplift (FAU) and Public Benefit

Introducing an FAU policy may also be a valuable mechanism that should be investigated for NURP. The concept is linked to FAR and could potentially provide Council with another mechanism to control built form outcomes but also offer incentives to developers. If Council had an FAU mechanism in place it could allow additional height or FAR up to a defined threshold. The additional value gained (Gross Realisation Value) of the increase in height or FAR would then be calculated based on the land use and precinct. Typically 10% of the Gross Realisation Value could then be allocated to a public benefit as listed in a public benefit schedule. A public benefit could be social housing.

Overshadowing

The study found that there is precedent to introducing a hierarchy to overshadowing guidelines for key places. The precedent extends the traditional planning equinox / times for assessment for places of significance, such as parks, boulevards, heritage and cultural spaces. Council can identify places of significance within NURP to determine whether they would benefit from the development of improved overshadowing guidelines.

Eg. City of Melbourne. *Solar access should be mainly protected for times when the mean maximum outdoor temperature in Melbourne is below 20C, which is generally between 22 April to 22 September. Control period times should reflect the broader usage of key public spaces; a wider date period from 22 April to 22 September and an overall time period of between 10am and 4pm should be tested, with between 12pm and 2pm considered a 'core' minimum control time period for all key public spaces.*

3. Determine if the UDEPM of NURP can be used as an ongoing evidence-based decision support tool

The UDEPM establishes that it is an evidence-based methodology that can be used to test, evaluate and compare the impacts of different design controls on both built form and environmental indicators. All the built form indicator data confirmed that the bulk applied through the building typologies within the UDEPM are economically feasible.